

may occur from the beginning of June to near the end of September. However the curve so formed is bimodal with a peak of records in the first three weeks of July and a secondary peak in the third and fourth weeks of August. The earliest date for *festucae* is 4th June (1960) and the latest 23rd September (1964).

*P. gracilis* seems to be essentially a July insect and nearly all the records are in this month. The earliest date being 27th June (1959) and the latest 2nd August (1963)—but I have noted already that the Baron de Worms took specimens at Witherslack on 11th August 1966. Pelham Clinton (1966) gives the dates for six Scottish examples of *gracilis* and these are all for July except one, which is for 1st August.

The status of these two species is a matter of considerable interest. No doubt the coming season will provide opportunity for a considerable expansion of our knowledge of both distribution and ecology. Should any collectors who have visited the Lake District have any records of these species I should be very grateful if they would let me have them for inclusion in the list of lepidoptera occurring in the Lake Counties which is in preparation.

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Kendal Wood, New Hutton, nr. Kendal.

## English Entomological Methods in the Seventeenth and Eighteenth Centuries

### PART II: WILKES AND DUTFIELD

By RONALD STERNE WILKINSON, F.L.S., F.R.E.S.

We have seen that when Eleazar Albin completed publication of his *Natural History of English Insects* in 1720 many sorts of apparatus and collecting methods had long been used, some being rudimentary forms of those in our present *repertoire*. The early eighteenth-century entomologist was equipped with pill boxes, collecting box of the 'chip' design, beating stick, lantern, pincushion and net of uncertain style; his searching procedure was much like ours, and when located the quarry was despatched by pinching, pinning or sulphur fumes if of a scaly-winged nature, by drowning in spirits if not. Larvae were reared in variously designed breeding boxes. The collection was often mounted on pins and kept in store boxes or cabinets, although other methods were in use.

The twenty years following Albin's edition of 1720 are usually considered a dark period in English entomology, but this theory is the result of insufficient investigation as Joseph Dandridge, Robert Antrobus, Samuel Dale, Benjamin Allen and a host of others were contributing to knowledge of the insect fauna. <sup>1</sup>Although relatively few new publications appeared, three more editions of the *English Insects* had been called for by 1735, the momentous year of Linnaeus' *Systema Naturae*. In this era the clap-net achieved universal acceptance; the lack of manuscript evidence leaves doubt as to why earlier designs declined in favour of this clumsy apparatus borrowed from the equipment of fowlers and market-hunters who used it to trap small birds at night.<sup>2</sup>

The first entomological writer to describe the clap-net seems to have been Benjamin Wilkes, a portrait painter who kept rooms "against the Horn Tavern in Fleet Street," London.<sup>3</sup> As he later explained, Wilkes was invited to a meeting of the first Aurelian Society, where "he first saw such Specimens of Nature's admirable skill in the disposition, arrangement, and contrasting of colours (particularly amongst the *Moths* and *Butterflies*) as struck him with amazement, and convinced him, at the same time, that studying them would turn greatly to his advantage." He applied for membership of the Society, was admitted, and with the help of its members acquired "a tolerable collection" of Lepidoptera<sup>4</sup>.

"Wilkes' first publication was the curious but attractive series of prints issued between 1st February 1741/2 and 8th June 1742. These consisted of coloured figures of moths and butterflies arranged in geometric patterns and furnished with such data as larval pabulum and times of pupation and emergence. The prints were undoubtedly sold individually in Wilkes' rooms, but were later collected and published with an engraved dedication "To the Worthy Members of the Aurelian Society" dated 15th June 1742. All existing copies of the publication (there are not many) are in collected form,<sup>5</sup> and the work, though untitled, is usually called *Twelve New Designs of English Butterflies*.

Although Wilkes mentions beating hedges for larvae in the caption to the fifth plate, he gives no other information about his collecting methods in the *Twelve New Designs*. This was, however, soon supplied in an undated supplementary sheet of instructions which we may assign to 1742 with some certainty as the prints of Lepidoptera are mentioned in terms that suggest that they may not yet have been in their collected state.<sup>6</sup> The sheet is the earliest publication completely devoted to entomological collecting methods I have found in any language, and as only one copy seems to have survived it is worth quoting *in extenso*. In it Wilkes introduces several important new pieces of equipment to the literature and gives a charming description of the pursuit of Lepidoptera in the mid-eighteenth century.<sup>7</sup>

In order to oblige such Persons as may be desirous to make a Collection of Moths and Butterflies, though unacquainted with the Manner how, it is judged proper to lay down the following Directions.

Provide a Net made of Muscheto Gause, and in Shape like a Bat-folding Net, let its Length be one Ell,<sup>8</sup> the Width at Bottom three Quarters of a Yard, at Top half a Yard, and cut circular; this must be sew'd to a Tape or Ferret, that it may be fasten'd to a couple of Hasle or other Sticks five Feet long each, the upper



CAPTURING INSECTS.

A clap-net in action. The anonymous *History of Insects* (London, 1839) contains as frontispiece one of the four illustrations of a clap-net in action. Although this illustration is dated almost a hundred years after Wilkes's instruction, the net is of a similar design.



whereof should be Circular to fit your Net.

You must likewise have a Stick of Hasle, or any other Wood, above five or six Feet in Length; wherewith to put the Flies and Moths on the Wing, by beating the Boughs, Hedges, Shrubs, or other Growths you are near, so that you may be able better to see and take them.

Furnish yourself likewise with Boxes of such Sizes as will go into your Pocket, let them be lin'd at the Top and Bottom with Cork; be also provided with a Pin-cushion, well stock'd with different Sorts of Pins.

These Things being in readiness, go into the Woods and Fields thereto adjacent, (always placing yourself where the Sun has most Power) also into Chalk-pits, rough Grounds, Lanes, &c. In all which Places, if it is a fine Day, and a proper Season of the Year, you will find Plenty of Sport.

When you have taken a Fly in your Net, lay the Net flat on the Ground, which will prevent the Fly from fluttering; then put the Fore Finger of your Left Hand under the Fly, and with the same Finger of your Right give it a squeeze on the Back or Chest, and that will kill it; be careful, however, not to press too hard, least you damage the Fly. This done, take a Pin, and run it through the Body, betwixt the Wings, letting that Side be uppermost which is most beautiful; then stick it in your Box, and look for more Sport.

Having collected such a Number of Flies as you think proper, and being return'd home, look into your Boxes, and observe which of them are fit to set: such as you find dead and not stiff are so.

Then (having prepar'd before hand two or three Boards cover'd with Cork, of about ten Inches by sixteen in Size, or as you find most convenient, to place your Flies in order on and extend their Wings in the best manner: by the Assistance of little Bracers made of a sound Cork, cut very smooth with a sharp Knife, into five or six Parts, each Part being again cut into five or six Lengths, or Slips, with a Pin thrust thorough [*sic.*] the End of each) proceed to manage them as follows:

Take a Fly out of your Box: see if the Pin be run thorough it perpendicularly if so, stick it on one of your setting Boards, and with the point of a Needle (which must be fixt into a small Stick, or what else you like best) extend one Wing leisurely, till such Time as the Point thereof is even with the Nose of the Fly you are setting. That done, fix one of your Cork Bracers gently on that Wing, to prevent its giving way; serve the other Wings in the same manner, and your Fly will appear extended as in the Prints.<sup>9</sup> Let the Bracers remain on the Wings of Butterflies a Fortnight, on those of great Moths a Month. Take Notice, however, that a great Number of small Moths must be set in your Boxes in the Field, otherways your Labour will be lost; you'll presently know which these are, by observing them to be dead and almost stiff; so that it is proper to carry always about you a little Box of Cork Bracers for this Purpose.

*The Way to preserve your Flies, after you have taken them from your Setting Board.*

If you put them in Drawers, Boxes, or Frames with Glasses before them, its proper to get some Camphire, or (what I think better) some pounded Pepper, inclose this in small Muslin Bags, and fasten it to those Places where your Flies are, by which Means you will destroy those small Insects that would otherwise injure your Flies; and by renewing now and then this Method, I am convinced your Flies may be preserved a great many Years. The Months in *England* that produce the greatest Variety of Flies, are *April, May, June, July, and August*, especially of the Butterfly Kind; and for Moths, I am of Opinion, that there are many different Species produced all the Year round. Thus much seemed necessary to say in Respect to taking Insects in the Fly State, and more would be superfluous.

*But as it may be agreeable to Some to breed the Flies themselves from the Caterpillars, I shall likewise give the best Instructions I am able for that Purpose.*

In the Spring Season, you may collect great Variety of Caterpillars, by spreading a Sheet under Oak Trees: then beating the Boughs, many Caterpillars will fall, which if taken Care of, will produce scarce and valuable Moths; you may also find Caterpillars on the Black-thorn, White-thorn, Bramble, Chick-weed, Willow, and many other Growths.

When you have collected a Number of Caterpillars, and remark'd the Food you found them on, put them into Boxes, which prepare as follows: Take a Deal or Wainscot Box, cut a large Square out of the Top and Bottom, cover the Part cut out with a Piece of Crape Hatband, glewing the same all round, to prevent any Escape. This done, put your Caterpillars into the Box, with some of the same Food you found them on, giving them, if you can, fresh every Day. Here you'll find them feed and thrive; and after changing their Skins two or three times, they will go into their Aurelia State, and there remain for a certain time, some much longer than others; but in about fourteen Days from this last change, you may look into your Boxes, to see if you have any Flies bred; remembering that such as are produced in this Manner, much more perfect Flies may be chosen from, than any can be caught.

The Method to kill great Moths is this, take a large Needle, which fix into a small Stick, dip the Point of it in double Aquafortis,<sup>10</sup> then thrust the Needle through the Stomach up into the Head; and altho' this may appear cruel, you cannot have your Flies in Perfection without it.

There is yet another Thing proper to be known, in order to compleat your Collection. A great Number of Caterpillars go into the Earth, and there change to Aurelias, whose Moths are seldom upon the Wing till Night; these Aurelias are to be got by digging with such a Trowel as the *Bricklayers* use, about the Roots of Trees, such as Oaks, Elms, Limes, Poplars, Willows, &c, also by the Sides of Walls and Pales. The usual Time to dig for them is from *September to March*.

When you have obtain'd a Number of Aurelias by digging, you must provide for them thus: Get some Earth and scowering Sand, mix them well together, and put the Mixture into some large Garden Pots; lay your Aurelias on that, covering them with Moss; then sew a Piece of Crape Hatband round a small Hoop, and put such a Cover on each Pot, in order to receive the Flies when bred, which will usually be in the Months of *March, April, May* and *June*. I have always kept my Pots of Aurelias out in the open Air, and the Flies have produced with great Success; however it may be proper to place a Piece of Board over each Pot, to prevent unforeseen Accidents.

Those who think proper to put these Directions in Practice, will, I am convinced, in a short Time, be possessed of a great Number of valuable Flies; and for their farther Information, I shall conclude, with giving an Account of the different Manner after which many Caterpillars change into the Aurelia State, whereby they will be better able to order their Breeding Boxes; for as several Sorts of Caterpillars go down into the Earth, some Earth must be put into the Boxes for that Purpose.

The sheet ends with "An Account of the different Manner after which several Caterpillars change into their Aurelia State", in which thirty-eight species are classified according to their method of pupation; the reader is directed to "the Prints" for other information useful in rearing.

Although Wilkes' pincushion and beating stick were traditional items of equipment, several methods appear for the first time in the printed instructions. Apart from the clap-net Wilkes used double-corked collecting boxes and setting boards, although the latter were much larger and of a different shape than ours, also lacking the now-familiar groove for reception of the insect's body. The cork "bracers" were ancestral to our card slips and setting tapes, and Wilkes' setting needle did not differ in principle from ours. Camphor and pepper made their appearance as repellents here, as did the beating sheet and method of digging for pupae with a bricklayer's trowel. Wilkes introduced nitric acid as a killing agent for moths; his "aqua fortis" was used as late as the nineteenth century, and oxalic acid solution was employed for the same purpose until recent years. Wilkes did not realize that his captures could be relaxed after stiffening, and appears to have discarded specimens that had undergone *rigor mortis* or dessication before they could be set. His rearing methods were quite modern, especially the insistence on airy and natural conditions. It is probable that few of these "new" ideas were Wilkes' own, but all may probably be assigned to the period following Petiver's main efforts.

Wilkes' *magnum opus*, *English Moths and Butterflies*, has tried the patience of more than one bibliographer. Lisney's statement that "the exact date of the publication" of the first edition "is not known with certainty" must remain valid until a set of the original fascicules is discovered—assuming the work was issued in that usual fashion.<sup>11</sup> The dates of 1747-60 given by H. A. Hagen in his *Bibliotheca Entomologica* (Leipzig, 1862) have been generally accepted, as in the catalogues of the British Museum and Brit. Mus. Natural History. Yet there is evidence that Hagen may have been wrong; the point is worth pursuing as the work must have had no small influence in popularizing the collecting methods

used by the first Aurelian Society, and we should like to be able to supply a more precise date for this important contribution.

Internal evidence shows that much of the work was under way in 1748-9. Wilkes gives the present date as 1748 on p. 23, and as 20th January 1748/9 on both pp. 29 and 48. Lisney owned a copy bearing the contemporary ink date 1749 on the last page, presumably indicating that all the plates and their text had been issued by the end of that year, i.e. March 1750, new style. If we postulate that the title and prefatory material was issued last as in the cases of Albin's *Natural History of English Insects* and Harris' *The Aurelian*, there is no reason to suppose that the entire work would not have been complete by 1750. In fact the preface could not have been written after 1752 as Wilkes stated in it that "for ten Years past his leisure Hours have chiefly been employed in the collecting and making Drawings of the different *English Caterpillars, Aureliae* or *Chrysalides, Flies, &c.*" We know that his interest in Lepidoptera dated from his first visit to the Aurelian Society, and his 'title' to the *Twelve New Designs*, dedicated to the Society, appeared in 1742. I suggest that the *English Moths and Butterflies* was issued between 1747 and 1749/50 or 1750, and that Hagen's "1760" may have been a misprint for 1750.<sup>12</sup>

The section on entomological methods in Wilkes' introduction (pp. [xx-xxi]) is partially taken from the sheet of directions described above. Lisney states that the undated sheet was merely reproduced in *English Moths and Butterflies*,<sup>13</sup> but this is not at all the case as several interesting changes were made that show how Wilkes gained from experience. For some reason the passage on killing moths with nitric acid was deleted. Apparently the author had given up the use of pepper after a bout with pests, for only camphor was mentioned as a preservative, and the amount of time that insects could be kept without damage was considerably reduced. Another hint as to Wilkes' troubles is gained from the added warning to rearers not to "take the *Chrysalides* out of the Earth, nor disturb them till the *Flies* are bred". Between publication of the undated sheet and the revised instructions Wilkes seems to have rediscovered the practice of 'mothing' used by Petiver; he suggests that "The best Time to take the greatest Variety of *Moths*, is for one Hour after Sun-set, and the properest Places are in and by the Sides of Woods, Gardens, Green Lanes, &c. where with your Net you'l seldom fail of Sport". In *English Moths and Butterflies* the cork setting braces were replaced with slips of card, and several other minor emendations may be found.

Wilkes mentions other methods than those in the introduction. Although he did not suggest use of an artificial bait, it was noted that butterflies were "extremely fond of the Juices that issue from the Bodies of several Sorts of Trees;"<sup>14</sup> he took moths feeding "on the Honey Dew, on the Limes and other Trees, in the Gardens of *John Philips, Esq.*; at *Layton* in Essex; they were discovered, by the Help of a Candle and Lanthorn, from Twelve o'Clock at Night till Two in the Morning; and were so fearless, that they would suffer one to take them with the Hand."<sup>15</sup> Such observations in a later era led Henry Doubleday to produce artificial honey-dew and invent the method of 'sugaring' trees with a brush.<sup>16</sup>

Wilkes searched flowers after sunset for hawk-moths,<sup>17</sup> and found many nocturnal species by examining the bark of trees during the day. He explained that the first *Catocala fraxini* to be taken in England was captured by this method; it was found "sticking against the Body of an